PATENT SPECIFICATION 1 219 012

DRAWINGS ATTACHED

1 219 012

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(31) Convention Application No. 3490 (32) Filed 10 March 1967 in
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(54) JACQUARD WITH ELECTROMAGNETICALLY CONTROLLED HOOKS

(71) We, WERKZEUGMASCHINENFABRIK OERLIKON BUHRLE K.G., a company organised and existing under the laws of Switzerland, of 8050 Zurich, Switzerland, do hereby declare the following invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to a Jacquard for operating healds which are movable between an upper and a lower position by means of griffe blades engaging electromagnetically controlled hooks formed directly on the healds without the intervention of harness cords.

A Jacquard according to the invention for operating healds which are movable between an upper and a lower position by means of griffe blades engaging hooks on the healds for raising the healds and by means of springs for lowering said healds includes a resiliently mounted hook on each heald forming an armature, a stationary knife for holding each heald in the upper position, and an electromagnet for effecting a connection between each resiliently mounted hook and its associated stationary knife in which the electromagnets are disposed above the stationary knives so that when energised each electromagnet draws a resiliently mounted hook into contact with its associated stationary knife to prevent lowering of the heald by the said spring to the lower position and in which by raising the healds the resiliency of the hook mounting pulls the hook out of contact with the stationary knife to allow movement of the heald towards the lower position when the electromagnet is de-energised.

The electromagnet is preferably mounted above the heald as a result of which a considerable amount of space can be saved in comparison with other known Jacquard machines in which the electromagnet is situated beside the heald. Furthermore, in a preferred embodiment of the invention, a stationary knife may be provided for more than one heald as a result of which the construction of the device is considerably simplified because a separate stationary knife is not necessary for each heald.

Various examples of embodiments of the subject of the invention are described in detail below with reference to the drawing in which:—

Figure 1 shows a Jacquard according to the invention diagrammatically in side elevation;

Figures 2 to 8 show different embodiments of a leaf spring with holding member and electromagnet for the Jacquard illustrated in Figure 1 on a larger scale;

Figure 9 shows a further embodiment of the leaf spring in front elevation;

Figure 10 shows the leaf spring illustrated in Figure 9 with the holding member in side elevation;

Figure 11 shows another embodiment of the leaf spring with holding member in side elevation.

With reference to Figure 1, a warp 11 is wound on a warp beam 10. This warp 11 runs over a back rest 12 and has a large number of warp threads of which only two warp threads 17 and 18 are illustrated in Figure 1. All the warp threads are guided in heald eyes. The upper warp thread 17 is guided in an eye 15 of a heald 13 and the lower warp thread 18 is guided in an eye 16 of a further heald 14. From the eyes 15, 16, the warp threads 17, 18 pass to the fell 19 from which the cloth 20 is wound on to a cloth beam 22 after having passed over a breast beam 21. A shuttle 23 is picked through a shed 46 formed by the warp threads 17, 18. Tension springs 25 and 26, which are secured by their free ends to the healds 13 and 14 and tend to pull the healds 13, 14 downwards, are attached to a stationary support 24.

The healds 13, 14 can be moved between an upper and a lower end position. The healds are lowered by means of springs 25, 26. The healds are raised by a drive comprising a griffe frame 30 with two griffes 31 and 32. A blade 33 is mounted on each griffe. The griffe frame 30 is mounted for

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(54) JACQUARD WITH ELECTROMAGNETICALLY CONTROLLED HOOKS

SPECIFICATION NO. 1,219,012

By a direction given under Section 17 (1) of the Patents Act 1949 this application proceeded in the name of WERKZEUGMASCHINENFABRIK OERLIKON-BUHRLE AG, a Company organised and existing under the laws of Switzerland, of CH-8050 Zurich, Switzerland.

THE PATENT OFFICE R 1652/1

heads without the intervention of harness cords.

A Jacquard according to the invention for operating heads which are movable between an upper and a lower position by means of griffe blades engaging hooks on the heads for raising the heads and by means of springs for lowering said heads includes a resiliently mounted hook on each head forming an armature, a stationary knife for holding each head in the upper position, and an electromagnet for effecting a connection between each resiliently mounted hook and its associated stationary knife in which the electromagnets are disposed above the stationary knives so that when energised each electromagnet draws a resiliently mounted hook into contact with its associated stationary knife to prevent lowering of the head by the said spring to the lower position and in which by raising the heads the resiliency of the hook mounting pulls the hook out of contact with the stationary knife to allow movement of the head towards the lower position when the electromagnet is de-energised.

The electromagnet is preferably mounted above the head as a result of which a considerable amount of space can be saved in comparison with other known Jacquard machines in which the electromagnet is situated beside the head. Furthermore, in a preferred embodiment of the invention, a stationary knife may be provided for more than one head as a result of which the con-

Figure 9 shows a further embodiment of the leaf spring in front elevation;

Figure 10 shows the leaf spring illustrated in Figure 9 with the holding member in side elevation;

Figure 11 shows another embodiment of the leaf spring with holding member in side elevation.

With reference to Figure 1, a warp 11 is wound on a warp beam 10. This warp 11 runs over a back rest 12 and has a large number of warp threads of which only two warp threads 17 and 18 are illustrated in Figure 1. All the warp threads are guided in heald eyes. The upper warp thread 17 is guided in an eye 15 of a heald 13 and the lower warp thread 18 is guided in an eye 16 of a further heald 14. From the eyes 15, 16, the warp threads 17, 18 pass to the fell 19 from which the cloth 20 is wound on to a cloth beam 22 after having passed over a breast beam 21. A shuttle 23 is picked through a shed 46 formed by the warp threads 17, 18. Tension springs 25 and 26, which are secured by their free ends to the healds 13 and 14 and tend to pull the healds 13, 14 downwards, are attached to a stationary support 24.

The healds 13, 14 can be moved between an upper and a lower end position. The healds are lowered by means of springs 25, 26. The healds are raised by a drive comprising a griffe frame 30 with two griffes 31 and 32. A blade 33 is mounted on each griffe. The griffe frame 30 is mounted for

displacement in guides, (not shown) and is in driving connection, through a connecting rod 36, with a crank 35 driven by a motor (not shown). Hooks 37, in which the blades 33 of the griffe frame 30 engage for raising the healds 13, 14, are secured to the healds 13, 14. Furthermore, guides 38 limit horizontal displacement of the healds during their movement between their upper and lower positions.

Secured to the upper ends of the healds 13, 14 are leaf springs 29 having a hook 45 at their upper end. Above the healds 13, 14 there are provided holding members in the form of stationary knives 39 by means of which the healds 13, 14 can be held in their upper position. Furthermore, above the healds 13, 14 there are provided electromagnets 40, 47 through the energisation of which the hooks 45 of the healds 13, 14 can be brought into engagement with the knives 39.

The holding member and the electromagnet are illustrated in more detail in Figures 2 and 3. As stated above, the holding member is constructed in the form of a stationary knife 39. The knife 39 may be adapted as a holding member for a whole row of healds 13, 14.

The edge 48 of the knife with which the hook 45 on the healds 13, 14 comes into engagement, is positioned so that contact of the hook 45 with the edge 48 is prevented so long as the springs 25, 26 tend to move the healds 13, 14 into the lower position. Mounted above each heald 13, 14 are electromagnets 40, 47 respectively. Each electromagnet 40, 47 has a winding 41 and a core 42. Secured to the core 42 is a pole having a face 44 inclined in relation to the axis of the magnets 40, 47. The hook 45 and the surface 44 of the magnet pole 43 are substantially parallel. The magnets 40, 47 can be energised by means not illustrated in such a manner that they tend to attract the hooks 45, which constitute armatures, that is to say they are produced from magnetisable material. The leaf springs 29 are bent towards the knife.

The stationary knife 39 is situated so that when the magnet 40 is not energised the path of movement of the hook 45 clears the knife 39. On the other hand when the magnet 40 is energised the path of movement of the hook 45 comes within range of the knife 39 and the hook 45 can come into engagement with the knife 39.

The mode of operation of a loom having a Jacquard as described is as follows: The description relates for simplicity to two warp threads and to two electromagnets as illustrated in Figure 1. In practice there are a vast number of threads and rows of electromagnets. The operation of these two warp threads 17, 18. The number of threads is similar in principle to that of the hooks and hence of electromagnets is 48 per centimeter across the width of the weave. The 48 magnets per centimeter loom width are arranged when seen in the direction of the weft in 16 rows so that looking in the direction of the warps, 3 magnets are located side by side per centimeter loom width. Consequently the Jacquard contains 4800 hooks and electromagnets per metre width. The warp threads 17, 18 are under tension between the back rest 12 and the breast beam 21, and the shed 46 is formed in the usual manner by raising and lowering the healds 13 and 14. The shuttle 23 travels through this shed 46 to introduce the weft thread. In the Jacquard machine described, the warp thread 17 is at its highest position and the heald is at its upper position while the warp thread 18 is in its lowest position. Thus the shuttle 23 can pass between the two threads 17 and 18. After each passage of the shuttle, the lowered warp threads 18 are returned upwards to their upper position by the heald drive against the force of the spring 26 and for the next passage of the shuttle, the warp thread 17 may be left in its upper position or lowered according to the pattern required. The healds are lifted by the griffe blades 33 engaging the hook 37 and are lowered by the springs 25, 26. The griffe frame 30 receives its motion from the crank 35 and is raised and lowered by this drive for each change of shed.

When the griffe frame 30 is raised into its uppermost position, shortly before the end of the stroke the blades 33 come into engagement with the hooks 37 of the healds 13 which are held in their upper position and raise these healds 13 into the position shown in Figure 2, that is to say when the griffe frame 30 is in its uppermost position the hooks 45 of all the healds 13, 14 are out of engagement with the knives 39. In order that a heald may remain in its upper position, therefore, the magnet must be energised by means (not shown) until the griffe frame 30 has travelled so far down from its uppermost position that the hook 45 has come into engagement with the knife 39.

When the magnet is energised the hook 45 at the upper end of the leaf spring 29, which bends slightly, is bent so far towards the left (in Figure 2) towards the magnet head 43 that the path of movement of the hook 45 comes within range of the knife 39 and when the heald 13 is lowered its spring 25 the hook 45 comes into engagement with the knife 39 and so cannot be lowered any further. During its downward movement, the griffe frame 30 then travels down without the heald 13 as a result of which the blade 33 comes out of engagement with the hook 37. In Figure 1, the heald 13 is in this

position. The spring 25 is extended and the blade 33 below the hook 37 of the heald 13 is not in engagement with the hook 37.

On the other hand, if the heald 14 is to be moved to its lower position, the magnet 47 is not energised as a result of which the leaf spring 29 is not drawn leftwards to engage the hook 45. Thus the hook 45 does not come into engagement with the knife 39 during the lowering of the heald 14 which can thus be lowered completely. In Figure 1 the heald 14 is in this lower position. The spring 26 has contracted during the lowering of the slide bar 30 and the hook 37 of the heald 14 has remained in engagement with the griffe 33 of the griffe frame 30.

Thus the knife 39 and the magnet 40, 47 determine in the manner described which healds are to be lowered with the griffe frame 30 under the action of the springs 25, 26. The griffe frame 30 can remain in the upper and lower positions for a short time if the passage of the shuttle 23 requires it. This is necessary, in particular, in looms having Jacquard operated healds using a single shuttle in order that the shuttle may pass completely through the shed extending over the whole width of the cloth before the change of shed is effected. In looms with a travelling shed in which there are a plurality of sheds extending over the whole width of the cloth, the shed opens immediately in front of a shuttle and can change into the next position immediately behind the shuttle.

The drive of the healds 13, 14 as described comprises a crank 35 and a griffe frame 30 for a specific number of healds 13, 14. If the number of healds is too great, then a plurality of such cranks and griffe frame may be provided.

The strength of the magnets 40, 47 on the one hand and the strength of the leaf springs on the other hand may be adapted to one another in such a manner that contact between magnet 40, 47 and hook 45 takes place fleetingly or not at all when the hook 45 passes out of the position shown in Figure 2 into the position shown in Figure 3. On the other hand, the inclination of the face 44 and of the hook 45 may be appropriately selected in such a manner that bending towards the left of the leaf spring 29 when the magnet 40 is energised is achieved with the minimum possible expenditure of energy so that the hook comes firmly into engagement with the knife 39 whereas the hook 45 travels clear of the knife 39 when the magnet is not energised.

In order to prevent the healds 13, 14 from being pressed too hard against their guides 38, the leaf spring 29 may be constructed as shown in Figures 4 and 5. This embodiment differs from the embodiment illustrated in Figures 2 and 3 essentially in that the leaf spring 29 is bent towards the right in the relaxed state as shown in Figure 4. Even in the position shown in Figure 5, in which the leaf spring 29 is in engagement with the knife 39, the resiliency of the leaf spring is such that it is still bent towards the right. The tension produced by the spring 26 or 25 when the leaf spring 29 is in this position produces a component of force which tends to urge the heald 13 against the griffe 33. The magnitude of this component is so determined that it will balance the component of force exerted by the leaf spring 29 towards the left. Thus the heald 13 is pressed neither against the guide 38 nor against the griffe blade 33.

The embodiment illustrated in Figures 6 and 7 differs from the embodiments described hitherto firstly in that the upper end of the leaf spring 50 is of T-shaped construction and secondly by a different shape of the knife 51. This T-shaped part forms a hook 52 co-operating with the knife 51. The knife 51 has a recess 53 into which the upper end of the leaf spring 50 can penetrate under the action of the magnet 40 in such a manner that the T-shaped hook 52 bears against the knife 51. As can be seen from Figure 1, the edge of the hook 52, which comes into contact with the knife 51, is situated in the plane formed by the leaf spring 50. As a result of this arrangement, no torque is produced in the leaf spring 50 by the force exerted on the heald 13 by the spring 25.

In the embodiment illustrated in Figure 8, a bent hook is provided as a hook 62 at the upper end of the leaf spring 60. The bending of this hook is such that the contact point between hook 62 and knife 61 lies in the plane formed by the leaf spring 60 in order to avoid torque on the leaf spring. Apart from this, the mode of operation of this form is the same as in the examples previously described.

The T-shaped hook 72 illustrated at the upper end of the leaf spring in Figures 9 and 10 has the advantage that it is easier to produce. Whereas the hooks on the leaf springs in examples previously described have to be bent before the leaf spring is hardened, this hook can still be bent when the leaf spring has already been hardened without the hardened leaf spring breaking because the bending necessary is considerably less than with the other hooks.

In the example illustrated in Figure 11, the leaf spring 80 differs from the leaf springs previously described essentially in its curvature. This curvature enables the rebound to be damped when the hook 82 of the leaf spring 80 comes into engagement with the knife 39. This damping of the rebound is effected by stretching of the leaf spring 80. The curvature of the leaf spring 80 determines the point where the hook 82 acts on

the knife 39. This point must be located on the left of the vertical heald to ensure that the torque acting on the engaged hook is superimposed upon the damping movement.

WHAT WE CLAIM IS:—

1. A Jacquard for operating healds which are movable between an upper and a lower position by means of griffe blades engaging hooks on the healds for raising the healds and by means of spring for lowering said healds, including a resiliently mounted hook on each heald forming an armature, a stationary knife for holding each heald in the upper position, and an electromagnet for effecting a connection between each resiliently mounted hook and its associated stationary knife in which the electromagnets are disposed above the stationary knives so that when energised each electromagnet draws a resiliently mounted hook into contact with its associated stationary knife to prevent lowering of the heald by the said spring to the lower position and in which by raising the healds the resiliency of the hook mounting pulls the hook out of contact with the stationary knife to allow movement of the heald towards the lower position when the electromagnet is de-energised.

2. A Jacquard according to claim 1 in which each electromagnet has a face inclined to the direction of movement of the heald and parallel to the leading edge of the electromagnet's associated hook.

3. A Jacquard according to either of claims 1 or 2 in which one edge of each knife and its associated hook are inclined in relation to the direction of movement of the heald in such a manner that a displacement of the hook in relation to the knife under the resiliency of the hook mounting is prevented so long as the heald is moving towards the lower position under the force of the springs.

4. A Jacquard according to any one of claims 1 to 3 in which each hook is mounted on its heald by means of a leaf spring the biasing force of which tends to hold the hook in such a position that it does not contact the stationary knife during movement of the heald.

5. A Jacquard machine according to any one of claims 1 to 4 in which the heald is guided in a guide and tensioned by a spring towards the position.

6. A Jacquard according to claim 4 in which the leaf spring is inclined relative to the vertical in the same direction both in the relaxed state and when in engagement with the hook.

7. A Jacquard machine according to claim 4 in which each hook is constructed in the form of a T-shaped hook and the holding member has a recess into which the leaf spring can penetrate.

8. A Jacquard according to claim 4 in which each hook is T-shaped and inclined to the vertical, and in which the edge for contact with the stationary knife is outside the plane in which the leaf spring lies.

9. A Jacquard according to claim 4 in which the hook is bent so that the edge for engagement with the stationary knife is in the plane in which the leaf spring lies.

10. A Jacquard according to claim 4 in which the leaf spring is inclined relative to the vertical, and the spring which lowers the heald when in engagement with the stationary knife exerts a force on the leaf spring which tends to cancel out the force in the opposite direction arising from the resiliency of the leaf spring.

11. A Jacquard according to any one of the preceding claims in which a stationary knife is provided for more than one heald.

12. A Jacquard substantially as hereinbefore described with reference to Figures 1, 2 and 3.

13. A Jacquard substantially as hereinbefore described with reference to Figures 4 and 5 or 6 and 7, or 8 or 9 and 10 or 11 of the drawings.

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Nottingham and London.

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1219012 COMPLETE SPECIFICATION

4 SHEETS This drawing is a reproduction of the Original on a reduced scale

Sheet 1

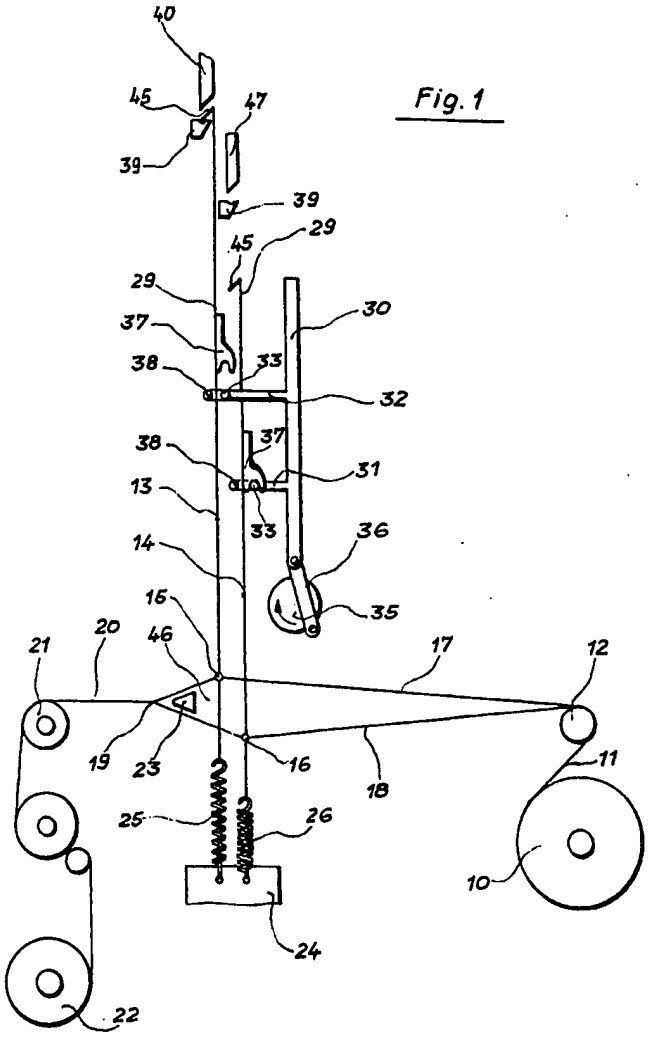

Fig. 1

Fig 2

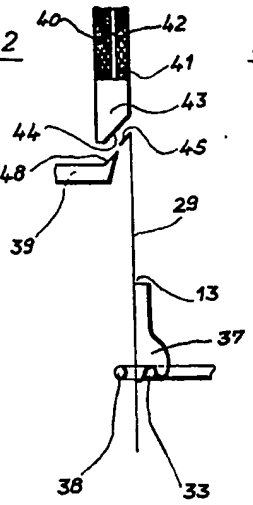

Fig3

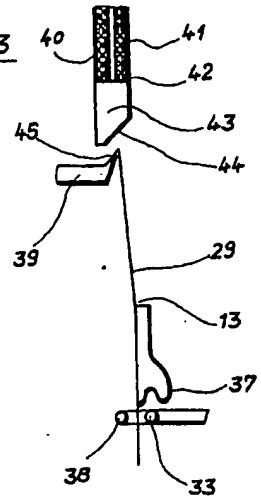

Fig4

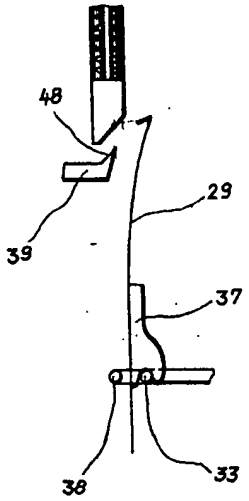

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Fig 6

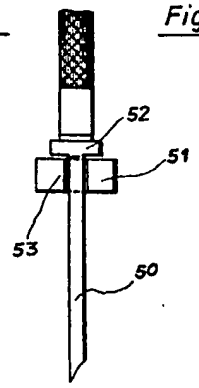


Fig 7

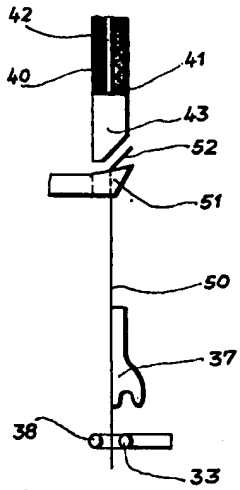


Fig 8

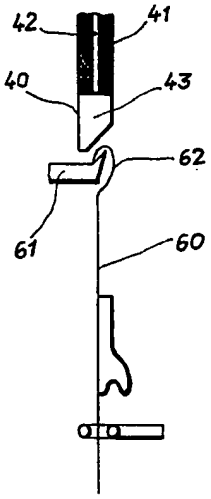


Fig 9

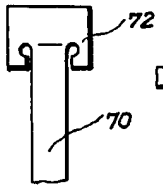


Fig 10

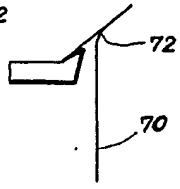
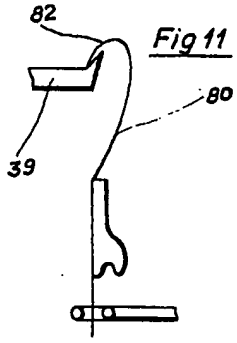


Fig 11



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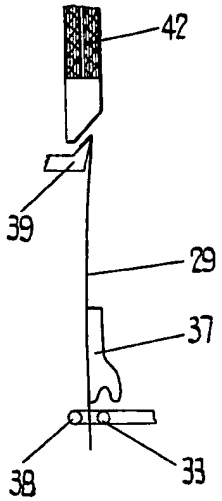

FIG. 5.